Listing of Claims:

This listing of claims will replace all prior versions of claims in this application.

1. (Cancelled)

2. (Cancelled)

3. (Cancelled)

4. (Currently Amended) ~~The~~ A method ~~of claim 1~~ of operating a mass spectrometer, the mass spectrometer including a source of ions, a mass analyzer, and a detector, the method comprising: ~~, wherein calculating a gain directly from intensity measurements comprises:~~

calculating a ratio of intensity values for at least two ~~of the~~ ions having different m/z values; and

calculating a gain of the detector based at least in part on the ratio of intensity values.

5. (Currently Amended) The method of claim 4, wherein:

calculating a gain of the detector based at least in part on the ratio of intensity values includes calculating a gain G according to the formula:

$$G = \frac{\overline{I_{ma}} * \sigma_{mR}^{2}}{k\left(\overline{I_{mR}}\right)^{2}\left(1 + \overline{I_{mR}}\right)}$$

where $\overline{I_{ma}}$ is a measured average intensity of a single peak corresponding to one of the at least two ions, σ_{mR}^{2} is the square of a standard deviation of the ratio, k is a transfer function associated with the detector, and $\overline{I_{mR}}$ is the ratio of intensity values.

6. (Cancelled).

7. (Cancelled).

8. (Currently Amended) The method of claim ~~14~~ 14, further comprising:

accumulating in the mass analyzer ions generated by a source of ions;

transmitting ions from the mass analyzer to the detector, the ions being selectively transmitted according to their respective m/z values; and

measuring intensity values for the transmitted ions to obtain the intensity measurements for the ions having a plurality of different m/z values.

9. (original) The method of claim 8, wherein:

the source of ions is temporally unstable.

10. (Currently Amended) The method of claim 8, wherein:

the intensity measurements obtained for ions having ~~at least two~~ a plurality of different m/z values have a substantially constant instantaneous variation contribution.

11. (original) The method of claim 10, wherein:

the substantially constant instantaneous variation contribution includes a contribution from instability of the source of the ions.

12. (original) The method of claim 8, wherein:

accumulating ions includes accumulating ions generated by the source of ions at substantially the same time; and

measuring intensity values includes measuring intensity values for at least two of the ions generated by the source of ions.

13. (original) The method of claim 8, wherein:

accumulating ions includes accumulating ions for an accumulation time, the accumulation time being selected to optimize the intensity measurements.

14. (Currently Amended) The method of claim ~~1~~ 4, wherein:
the mass analyzer includes a pulsed-type analyzer.

15. (Currently Amended) The method of claim ~~1~~ 4, wherein:
the mass analyzer includes a trapping-type analyzer.

16. (Currently Amended) The method of claim ~~1~~ 4, wherein:
the source of ions includes an ion source selected from the group consisting of an electrospray ionization source, atmospheric pressure chemical ionization sources, atmospheric pressure photo-ionization sources, atmospheric pressure photo-chemical-ionization sources, matrix assisted laser desorption ionization sources, atmospheric pressure MALDI sources, and secondary ions ionization sources.

17. (Currently Amended) The method of claim ~~1~~ 4, wherein:
the mass analyzer includes a mass analyzer selected from the group consisting of ion trap mass analyzers, Fourier Transform ion cyclotron resonance mass analyzers, orbitrap mass analyzers, and time of flight mass analyzers.

18. (Currently Amended) The method of claim ~~1~~ 4, wherein:
the detector includes an electron multiplier.

19. (Currently amended) A mass spectrometer, comprising:
a source of ions;
a mass analyzer configured to accumulate ions from the source of ions and to selectively transmit the accumulated ions according to their respective m/z values;
a detector configured to receive ions transmitted by the mass analyzer, the detector being operable to generate a signal representing an intensity of ions of each detected m/z value; and

control means operable to calculate a ratio of intensity values for at least two ions having different m/z values, and to calculate a gain of the detector based at least in part on the ratio of ~~directly from~~ intensity values ~~measurements for ions having a plurality of different m/z values~~. .

20. (currently amended) A computer program product on a computer readable medium for operating a mass spectrometer, the mass spectrometer including a source of ions, a mass analyzer, and a detector, the computer program product including instructions operable to cause a programmable processor to perform a method comprising the steps of calculating a ratio of intensity values for at least two ions having different m/z values, and calculating a gain of the detector based at least in part on the ratio of the intensity values ~~directly from intensity measurements for ions having a plurality of different m/z values~~.

21. (Cancelled)

22. (Cancelled)

23. (Cancelled)

24. (Currently Amended) ~~The~~ A method of ~~claim 21~~ operating a mass spectrometer, the mass spectrometer including a source of ions, a mass analyzer, and a detector, the method comprising: ~~, wherein calculating a gain directly from intensity measurements comprises~~:

calculating a ratio of intensity values for at least two of the ions having different m/z values; and

calculating the number of ions being detected by the detector based at least in part on the ratio of intensity values.

25. (original) The method of claim 24, wherein:

calculating the number of ions based on the ratio includes calculating the number of ions N according to the formula:

$$\overline{N_a} = \frac{\left(\overline{I_{mR}}\right)^2\left(1+\overline{I_{mR}}\right)}{\sigma_{mR}^{\ 2}}$$

where $\sigma_{mR}^{\ 2}$ is the square of a standard deviation of the ratio, and $\overline{I_{mR}}$ is the ratio of intensity values.

26. (Cancelled)

27. (Cancelled)

28. (Currently Amended) The method of claim ~~21~~ 24, further comprising:

accumulating in the mass analyzer ions generated by a source of ions;

transmitting ions from the mass analyzer to the detector, the ions being selectively transmitted according to their respective m/z values; and

measuring intensity values for the transmitted ions to obtain the intensity measurements for the ions having a plurality of different m/z values.

29. (original) The method of claim 28, wherein:

the source of ions is temporally unstable.

30. (Currently Amended) The method of claim 28, wherein:

the intensity measurements obtained for ions having ~~at least two~~ a plurality of different m/z values have a substantially constant instantaneous variation contribution.

31. (original) The method of claim 30, wherein:

the substantially constant instantaneous variation contribution includes a contribution from instability of the source of the ions.

32. (original) The method of claim 28, wherein:

accumulating ions includes accumulating ions generated by the source of ions at substantially the same time; and

measuring intensity values includes measuring intensity values for at least two of the ions generated by the source of ions.

33. (original) The method of claim 28, wherein:

accumulating ions includes accumulating ions for an accumulation time, the accumulation time being selected to optimize the intensity measurements.

34. (Currently Amended) The method of claim ~~21~~ 24, wherein:

the mass analyzer includes a pulsed-type analyzer.

35. (Currently Amended) The method of claim ~~21~~ 24, wherein:

the mass analyzer includes a trapping-type analyzer.

36. (Currently Amended) The method of claim ~~21~~ 24, wherein:

the source of ions includes an ion source selected from the group consisting of an electrospray ionization source, atmospheric pressure chemical ionization sources, atmospheric pressure photo-ionization sources, atmospheric pressure photo-chemical-ionization sources, matrix assisted laser desorption ionization sources, atmospheric pressure MALDI sources, and secondary ions ionization sources.

37. (Currently Amended) The method of claim ~~21~~ 24, wherein:

the mass analyzer includes a mass analyzer selected from the group consisting of ion trap mass analyzers, Fourier Transform ion cyclotron resonance mass analyzers, orbitrap mass analyzers, and time of flight mass analyzers.

38. (Currently Amended) The method of claim ~~21~~ 24, wherein:

the detector includes an electron multiplier.

39. (Currently Amended) A mass spectrometer, comprising:

a source of ions;

a mass analyzer configured to accumulate ions from the source of ions and to selectively transmit the accumulated ions according to their respective m/z values;

a detector configured to receive ions transmitted by the mass analyzer, the detector being operable to generate a signal representing an intensity of ions of each detected m/z value; and

control means operable to calculate a ratio of intensity values for at least two of the ions having different m/z values, and calculating the number of ions detected by the detector ~~directly from intensity measurements for ions having a plurality of different m/z values~~ based at least in part on the ratio of intensity values.

40. (Currently Amended) A computer program product on a computer readable medium for operating a mass spectrometer, the mass spectrometer including a source of ions, a mass analyzer, and a detector, the computer program product including instructions operable to cause a programmable processor to perform a method comprising the step of calculating a ratio of intensity values for at least two ions having different m/z values, and calculating the number of ions being detected by the detector ~~directly from intensity measurements for ions having a plurality of different m/z values~~ based at least in part on the ratio of intensity values.